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Food &amp; Nutrition

## Research Briefs

**Soy Protein Dropped Men's Cholesterol**

Soy protein may be an important ally in lowering cholesterol. New findings indicate that it can enhance the effects of a diet designed to lower cholesterol—both for men whose levels are in the safe cholesterol range and for those above it.

The study involved 26 men, 20 to 50 years of age, half of whom had high cholesterol. All consumed the National Cholesterol Education Program's Step I diet to lower their cholesterol—but with a special twist. Half of the subjects were getting their protein from soy; half from meat. Then, after a 10- to 15-week "washout" period, the two groups switched diets; those getting soy switched to meat and vice versa.

Men who began the study with elevated cholesterol had a 13 percent drop in the artery-damaging LDL cholesterol while consuming the soy protein and only an 8 percent reduction while eating meat protein. Even the men who began the study with cholesterol levels in the safe range differed in LDL reduction from the two types of protein. With soy protein, their LDL dropped 11 percent compared to 5 percent with meat. Both groups improved more with soy protein regardless of their age or weight. The findings will be in an upcoming issue of the *American Journal of Clinical Nutrition*.

The study's design may also explain why previous studies have produced conflicting evidence concerning the merits of soy protein. Researchers suggested that previous studies finding little benefit from soy may not have included a washout period or adequately monitored subjects' diets. The men in this study ate only prepackaged meals prepared at the center.

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**Deadly E. coli Toughen With Heat**

Foodborne bacteria that were previously subjected to lower heating temperatures may be tougher to kill, a new study shows. *E. coli* 0157:H7 bacteria that sustained a sublethal

dose of heat were more heat-resistant than bacteria that were not exposed to such heat. The results strongly suggest that cooking regimes designed to kill *E. coli* and other foodborne pathogens be based on the pathogen being in its most heat-resistant state.

The researchers heated beef gravy samples contaminated with *E. coli* 0157:H7 to 115 degrees F for 15 to 30 minutes. The heat was not sufficient to kill the bacteria. But it was enough to stimulate an adaptation to the stressful heating conditions. The researchers continued cooking the gravy to a final internal temperature of 140 degrees F. Preheated *E. coli* survived 1.5 times longer at the higher temperature than *E. coli* not subjected to sublethal temperatures. And the increased heat tolerance lasted for at least 48 hours.

The findings, published in the *Journal of Applied Microbiology* (vol. 84, pp. 677-684), have implications for food processors: Slowly heating foods to the final cooking temperatures normally used may not kill bacteria. Such conditions may occur in refrigerated, cook-in-bag foods such as filled pasta, beef stew, roasts and soups. The slow heating rate and low heating temperatures widely used to prepare these foods may make potential pathogens more heat resistant.

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**E. coli Detection—Accurate, Fast & Easy**

A new, rapid, easy-to-use test that detects *E. coli* 0157 in food products is from 10 to 100 times more sensitive than other tests for the sometimes deadly bacterium. And it works on hamburger meat. An ARS biochemist developed the test using equipment and technology patented by IGEN International, Inc., of Gaithersburg, Maryland.

The test uses magnetic beads coated with antibodies to *E. coli* 0157 and antibodies labeled with ruthenium. This metal, through a chemical reaction, emits light that helps detect the presence of *E. coli*. No special training is necessary to conduct the inexpensive test. The equipment, including a computer, can fit on a small table. And 50 samples can be tested in an hour. Total time from sample to

answer: only 6-8 hours. A graphic presentation about the test is on the Internet at <http://craw.arserrc.gov/ecolitest/index.htm>.

A large commercial meat supplier is evaluating the test. From the new assay, IGEN hopes to develop a line of fast, highly sensitive tests that will help food producers detect contaminants.

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## Nothing Fishy About DHA's Benefits

A natural compound in fish and meats improved two cardiovascular health indicators in six study volunteers. When these volunteers ate foods enriched with an omega-3 fatty acid called DHA, they had an increase in HDL cholesterol—the kind known to protect against heart disease. And blood fats known as triglycerides decreased by about 26 percent, the researchers reported in *Lipids* (vol. 32, pp.1137- 1146).

The volunteers on the high-DHA regimen also showed an increase of about 69 percent in apoprotein-E, a compound that carries cholesterol to the liver for breakdown and excretion. An apo-E increase had not been reported in other DHA studies with humans, according to the study leader. The study was designed to distinguish the effects of DHA from those of another omega-3 fatty acid, EPA. Both occur in fish oils thought to have cardiovascular benefits.

Ten healthy, non-smoking men age 20 to 39 lived at the research center for the four-month investigation. Scientists added about a teaspoon of DHA-rich oil to salad dressings or bean, salsa or guacamole dips served to six volunteers, substituting safflower oil in the servings for other men. DHA is short for docosahexaenoic acid.

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## Plant-Rich Diets Relax One's Defenses

A diet rich in leafy green and yellow-orange vegetables and fruits, whole grains, raisins and nuts supplies plenty of antioxidants. Twelve women, ranging from 34 to 84 in age, relaxed their own antioxidant defenses when they switched to this diet from a typical western diet—high in refined foods and low in fruits and vegetables.

ARS scientists collaborated on the study conducted at the private SPHERA Foundation in Los Altos, California. To assess the antioxidant power of each diet, they measured two enzymes that protect cells against oxidative damage. A copper-containing enzyme, superoxide dismutase, dropped

by two-thirds when the women ate the plant-rich diet. The selenium-containing enzyme, glutathione peroxidase, dropped by one-third.

For four weeks, the volunteers consumed all the white bread, pasta, pastry, snack foods, convenience foods, meat, fish, poultry, eggs and dairy their hearts desired. But they had to limit fruits and vegetables to two servings a day, avoiding leafy green and yellow varieties altogether.

Then, for four weeks, they ate at least six servings daily of green and yellow fruits and vegetables. They switched to whole grain bread and ate as many other whole grains and legumes as they desired. In addition, every day they downed two tablespoons each of almonds, hazelnuts, pecans and sesame oil (tahini); a tablespoon of wheat germ oil for cooking or dressing foods; three small boxes of raisins; and a cup of ginger tea and two cups of green tea. Refined products and reduced-calorie and fat-free products were verboten, as were fried foods. Eggs were allowed, but meat, fish and poultry were limited to a meager 3 ounces per week. Dairy products could have no more fat than 1 percent.

While most research is being done on the health benefits of a few plant compounds, the researchers advise that the epidemiologic evidence for health benefits is associated with diets rich in fruits and vegetables, not individual compounds.

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## Processing Bran Lowers Rats' Cancer Risk

Processing improved the ability of wheat bran to reduce an indicator of colon cancer in a study of rats. Wheat bran heated and shaped into short, crispy strips for a commercial breakfast cereal was more effective than raw wheat bran in reducing aberrant crypt foci, or ACF, which signal colon cancer in people as well as laboratory animals. The animals fed processed wheat bran had 33 percent fewer aberrant crypt foci in their colons than rats fed raw wheat bran. All had been injected with a chemical that stimulates formation of ACF.

Colorectal cancer is the second deadliest cancer in the U.S., killing nearly 55,000 Americans every year. Researchers have known for more than a decade that feeding raw wheat bran to lab animals reduces the occurrence of ACF. Bran is the thin, fiber-rich outer layer of the wheat kernel.

Researchers with ARS and the University of California at Davis conducted the 6 1/2-month study, which was partly funded by Kellogg Co. They fed 120 white lab rats a diet that included either processed or raw wheat bran. For the



study, the processed bran was heated and shaped in a food-processing machine known as an extruder.

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### **Antioxidant Boost in HIV-Infected People**

A small study may help settle the controversy over whether HIV-infected people can improve their natural antioxidant status by taking supplements of the amino acid cysteine. The findings, soon to be published in the *American Journal of Physiology*, indicate that they might.

People with HIV are known to develop lower levels of the antioxidant glutathione (GSH). And those with low glutathione levels get more secondary infections and cancers and have a higher mortality rate. Some studies have shown that a form of cysteine called NAC (N-acetylcysteine) boosts GSH levels. Others have suggested that NAC is ineffective. A large industry is built around selling GSH and NAC supplements.

Researchers asked five HIV-infected volunteers with no symptoms of AIDS to take NAC supplements for one week. Their glutathione-making efficiency increased by 40 percent, equaling the synthesis rate in five normal, healthy individuals. And the amount of glutathione in their blood cells increased by 15 percent in a week's time. This confirms other findings in the U.S. and in Brazil, Mexico and Germany that NAC is helpful.

The study also explains why people with HIV have low glutathione. It appears that the HIV-infected volunteers sometimes were producing the antioxidant too slowly—rather than using it too quickly. The researchers reached this conclusion after comparing GSH synthesis rates in the five HIV-infected research volunteers and five healthy participants. They used amino acids tagged with stable isotopes—easily traced, non-radioactive forms of elements—to study how the body synthesizes GSH.

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### **New Margarines Go Softer on the Heart**

It's easier to limit your intake of trans fats and soften their effect on the heart with new margarines that have been hardened without partial hydrogenation. The new spreads evolved from findings by ARS scientists and others. In the ARS study, researchers looked at the effects of butter and two margarines—one made without trans fats—on blood lipids of 46 volunteers in a 15-week study.

Not surprisingly, butter evoked the highest total cholesterol and artery-damaging LDL cholesterol levels. After consum-

ing a margarine containing trans fats for 5 weeks, the volunteers' total cholesterol was 3.5 percent lower—and LDL was 5.4 percent lower—than with butter. Five weeks of eating the margarine without trans fats made an even bigger dent in blood lipids. Compared to levels with butter, total cholesterol and LDL were 4.7 and 6.7 percent lower, respectively. The findings are reported in the *American Journal of Clinical Nutrition* (vol. 68, pp. 768-777). The changes were larger than could normally be expected, because the volunteers consumed three to four times more of the spreads than the average American.

The researchers conclude that people would be wise to limit trans fats wherever they can—as long as they don't replace these with heart-damaging saturated fats. Trans fats make up an estimated 2 to 3 percent of total calories in the U.S. diet. And most of that comes from partially hydrogenated oils in margarines, shortening in baked goods, and restaurant-fried foods.

The study's trans-fat-free margarine had 21 percent saturated fat, compared to 16 percent for typical margarine and 53 percent for butter. More than half the saturated fat in the trans-fat-free margarine, however, was stearic acid, which doesn't raise blood lipids.

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### **More Vitamin D May Benefit Black Women**

New findings suggest that African American women living in the northern latitudes may benefit from increasing their vitamin D intake. The vitamin is essential for absorbing calcium and thus is integral to strong bones. But the African American women in an ARS study had about half as much 25-hydroxyvitamin D—the most sensitive measure of D status—circulating in their blood throughout the year as the white women. The African Americans also had smaller increases in circulating vitamin D during summer. Sunlight stimulates skin to make the vitamin, but pigmented skin makes less.

Researchers measured indicators of bone health in 90 healthy, young women—51 African American and 39 white—living in the Boston area. In the winter when vitamin D levels are lowest, an important hormone called parathyroid hormone was elevated only in the African American women. This hormone signals that blood calcium is low, and it can stimulate loss of calcium from the bones.

The African American women got nearly as much vitamin D and calcium from food and supplements as the white women. So intake was not a major factor in the racial differences, the researchers reported in the *American Journal of Clinical Nutrition* (vol. 67, pp. 1232-1236). Apparently, African American women living in northern

latitudes don't manufacture enough vitamin D during the summer to carry them through the winter months, the researchers concluded.

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### **"Health Pulse" of the Delta Region**

High blood pressure and teen pregnancy are the top health problems in the U.S. Delta region, according to a survey of 500 community leaders there. The survey, which covered 36 counties in Mississippi, Louisiana and Arkansas, also showed that leaders in all three states think residents eat too many high-fat foods. The leaders included ministers, public health officials, teachers and other individuals with a knowledge of their towns. They were asked to rate the top health and nutrition problems and speculate on their causes.

Arkansas leaders rated teen pregnancy as the top health problem; the other two states cited high blood pressure. For nutrition, high-fat foods topped the list, followed by too much fast food and a lack of nutritional information.

The survey was the work of the Delta Nutrition Intervention Research Initiative (Delta NRI). ARS and six universities in the three states joined forces to create the project to identify nutrition and health problems in Delta communities and find ways to help solve them. The survey of community leaders is a first step. It tells Delta NRI members what programs would be well received and effective. Residents are now answering diet and health questions to validate the community leaders' perspectives.

Compared with national figures, average birth weight is lower in the Delta region, and Delta families have higher rates of infant mortality and cardiovascular disease. The Delta poverty rate averages 29 percent versus the 12-percent national average.

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### **Microbes Protect Spuds From Storage Rot**

A bacterium patented by ARS to reduce *Fusarium* dry rot in stored potatoes has proven 50 percent more effective than a synthetic chemical now used to control rot in commercial storage bins. The chemical, thiabendazole (TBZ), is the only federally registered fungicide for potatoes destined for human consumption. Dry rot fungi plague the potato industry worldwide, causing a dark tissue discoloration on the potato that eventually forms a dry, crumbly rot. Annual losses in stored potatoes in the United States are estimated at more than \$100 million.

Scientists with ARS, the University of Idaho and United Agri Products, Inc., of Greeley, Colorado, tested potentially protective bacteria on bin-stored potatoes at four North Dakota and Idaho sites. A report on the studies is in *Phytopathology* (vol. 87, pp. 177-183).

The most outstanding bacterium tested was a strain of *Enterobacter cloacae*. It reduced dry rot an average of 21 percent in contrast to 14 percent by TBZ. And ARS scientists have shown the microbe can be produced in a liquid culture system compatible with industrial fermentation practices. It is one of 18 bacteria ARS patented as dry rot inhibitors. The agency is seeking to license the microbes or form cooperative agreements to develop biocontrol products.

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